

Spectral transformation of ASTER data and the discrimination of hydrothermal alteration minerals in a semi-arid region, SE Iran

Abstract:

We investigated the spectral transformation of Advanced Space-borne Thermal Emission and Reflection Radiometer (ASTER) remote-sensing data of a semi-desert realm. Hydroxyl-bearing mineral zones were identified and discriminated based on distinctive shortwave infrared radiation (SWIR) properties of the ASTER data. Principal component analysis (PCA), minimum noise fraction (MNF), and band ratioing methods were applied, compared and combined in order to accurately locate hydrothermal alteration zones in two major mining districts of SE Iran. The strategy in this study consisted of using PC images and associated statistics factors yielded by PCA transformation for the identification of vegetation and iron oxide minerals in the visible and near infrared radiation (VNIR), clay minerals in the shortwave infrared radiation (SWIR), and silicate rocks in the thermal infrared radiation (TIR) of the ASTER data, respectively. The PCA results were verified by comparison with obtained results by minimum noise fraction and band ratio methods and also prior knowledge about the study area. In conclusion, the discrimination of alteration zones with high potential for copper and gold mineralization by spectral transformation of the ASTER data is a reliable, fast and relatively low cost with great ability to assist exploration geologists in the reconnaissance stages of mineral exploration.